acted, would soon so diminish the velocity of flight as to bring it below the degree at which the upward resistance of the air would sustain the carriage; it is therefore the office of the steam-engine, and its vanes, or propellers, to counteract that opposition, and continually maintain, at its original amount, the velocity of flight.

The difficulty which this contrivance avoids is the following. No source of power at present known will sustain in the air the materials and apparatus necessary to the production and application of the power; none is light enough in proportion to its effect. It is to this fact that all previous failures are to be attributed: but it is an axiom of mechanical science, which is well established by the coincidence of its consequences with the results of experience, wherever they can be compared, that a body once in motion will continue to move for ever, if opposing forces be taken away or balanced. Mr. Henson, therefore, sets his machine in motion by its descent down the inclined plane, and keeps it in motion by balancing the resistance with the action of his steam-engine. Now as the resistance to flight, which alone the steam-engine has to counteract, is but a fraction of the upward resistance by which the vehicle is sustained, it follows that the machinery to be carried, amounts, *in weight*, to but a small part of that required by all former inventions of the kind. To put the same in another view: the power by which the machine proceeds and is sustained, is ever that which it acquired by its descent down the inclined plane, and the decay of that power is prevented by the action of the steam-engine, just as the pendulum of a clock continues to vibrate by virtue of the power which originally drew it out of the perpendicular, while the gradual destruction of that power is prevented by the gentle pressure of the weight on it through the wheels. The weight, much too slow to *set* the clock a-going, is fully able to *keep* it so.

With remarkable similarity to this procedure, it may often be observed that a large bird will start from an eminence by first making a descent: when he has not this advantage his first few strokes are much more violent than the rest, that he may be sustained while he acquires the requisite velocity: afterwards the beats of the wings are slow and easy, and are sometimes intermitted altogether. Whoever watches the flight of various kinds of large birds, will observe many illustrations of the same principle.

Closely analogous, therefore, as parts of Mr. Henson's invention are to the arrangements of nature, and strictly as they comply with the requisitions of established science, there seems, so far, little room to doubt his success. There remains, however, one question to which an answer is not so easily given, viz. will the steam-engine be sufficient to counteract the forward resistance?

The novelty of the steam-engine lies chiefly, if not entirely, in its boiler and condenser. The former consists of nearly fifty hollow truncated cones, averaging about three feet in length, and of four inches and a half in their greatest width; their blunted points, of about one inch in diameter, are downwards, and the whole are arranged above and about the fire; they present about fifty square feet to the action of radiating, and about as much more to that of communicative heat. The steam is worked in two cylinders, in which it is cut off at one-fourth of the stroke. Computing the power of the boiler to generate steam, by data derived from the effects of those of railroad engines, we conclude that the engine will be found of nearly twenty-horse power.

But the resistance which this power is destined to overcome, is not to be ascertained with correctness by any data which science or published experiments supply. The theory of the resistance of fluids to oblique surfaces, at small angles, is the most obscure part of the great system of mechanical philosophy; there is no traceable agreement between its results and the data derived from experiments, and the few experiments which have been made were undertaken with other views, and supply no facts which are applicable to the present question. Mr. Henson has, therefore, done wisely in deriving his data from the best observations he could make on the proceedings of nature, and from these there is reason to conclude that the power of his steam-engine will be found sufficient. It is, however, satisfactory to know that, if his engine should need reinforcement, there are inventions, some of which are not yet published, by which its power may be much *more than doubled without materially adding to its weight.*

The condenser is composed of a number of small tubes, into which the steam is admitted, and which are exposed to the current of air produced by the rapid flight of the machine. The plan has been found perfectly efficient; and it dispenses with the necessity for carrying water, either to supply the place of that which is discharged as steam when it has performed its work, as in high-pressure engines, or to condense it that it may be returned to the boiler. The effect of these improvements in the boiler and condenser, combined with extreme simplicity and lightness in the other parts of the engine, is such that, though the engine is of the power of twenty horses, it is worked with twenty gallons of water; and its entire weight, with its boiler filled, is not more than 600 lbs.

The velocity and length of flight depend upon the same considerations as affect the sufficiency of the engine; they must, therefore, abide the test of experiment. There is good reason, however, to conclude, from the nature of the case, that high speeds and long flights will necessarily follow the attainment even of the lowest success.

The annals of mechanical invention prove that, whenever a step has been gained by which an important art has been brought prominently before the public mind, the thoughts of many and able men have been immediately turned to it. In this most extraordinary matter it is impossible that the same concentration of attention and research should not take place: we may, therefore, safely anticipate that, ere long, men will have added a new element to their dominion; and, having explored the recesses of the earth, and become familiar with the bottom of the sea, they will at length waft themselves through the unobstructed tracts of air, and make their roads upon the winds.

DESCRIPTION.

A, the main frame, or wings, composed of the longitudinal pieces, *a, a, a, a, &c.*, and the bow-like individual frames across them.

B, B, B, &c., upright posts, or standards, to the upper and lower ends of which metallic braces, shewn by the single lines, are attached, supporting various points in the frame.

C, C, a longitudinal piece, which forms the outer boundary of the space required for the vanes, or propellers.

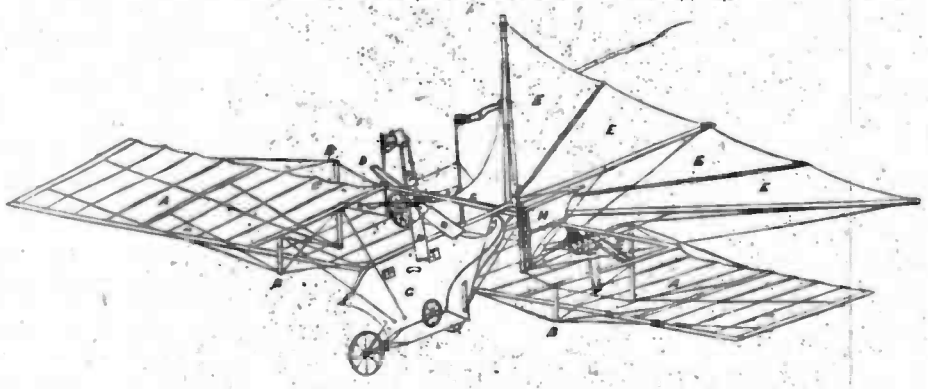
D, D, D, &c., the vanes, or propellers, mounted on shafts, as shewn in the figure, and drawn by steam-engines by means of bands.

E, E, &c., the tail, turning on a joint at *F*.

G, the car; containing the steam-engine, cargo, conductors, and passengers, in suitable compartments.

H, the rudder.

The covering of the wings and tail is of silk or linen: that of the wings is divided into three lengths for each end, joining each other at the double frames shewn: this division facilitates the rapid reefing and spreading of the covering, which is effected by the cords running parallel with the longitudinal pieces, *a, a, a, &c.*, of the wings. The tail and rudder are, in like manner, governed by cords proceeding from the car.



BIELEFELD'S PAPIER MACHE WORKS.

THE continuation of "our walk" through the above establishment, and the illustrations we have at hand concerning it, must give way to the novelty which this week's paper records; but we seize this occasion to say a word in reference to an observation in last week's paper, in which we might be misunderstood as speaking lightly of the interests of the Plasterers; this, however, is out of the farthest reach of our thoughts. Ten or twelve thousand men are not to have their interests trifled with; and it is because we do not think the branch of manufacture under notice is one to compete disadvantageously with them, that we expressed ourselves as we did on the former occasion; but we shall be able to shew more of the grounds of our opinion on resuming the article.

LITERARY AND SCIENTIFIC INSTITUTION, HUNTINGDON.

WE have been favoured with an inspection of the lithographic print of this edifice. The drawing is very efficient, and is by Mr. Rudge, artist, of Bedford, who has very happily combined the street view with a prominent perspective of the Institution. We can sincerely award our praise to the architects, Messrs. Pocock and Glover, of Huntingdon, for the merit of their design. It is in the best spirit of the classic style, naturalized, if we may so speak, and adapted to its site and locality. There is a breadth and picturesque sobriety of character about it that reminds us of Inigo Jones's manner, although the whole thing is [illegible] condition, to be one of its greatest merits. A statue of Minerva crowns the centre of the cornice, and so long as we are in the humour to take Greek and Roman personifications of Wisdom and the other Virtues, so long a plea of propriety may be urged in favour of such use of her godship as the present. But something might be said, and some early day will be said, to settle these things upon a more rational basis. We throw out this point for the consideration of the clever designer of this structure. A vigour of thought is marked upon his production, which, grappling with questions such as we have started, will lead him to conclusions worthy of being followed. The style of the lithography is very pleasing, and is from the pen of Mr. Madely, of Wellington-street, Strand. We shall endeavour to sustain our judgment by bringing a view of the building before our readers; and we think we may venture to make a promise of the engraving for the forthcoming week.